

SPECIAL HANDLING

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PROGRESS REPORT

PERIOD OF 1 OCTOBER 1965 TO 31 OCTOBER 1965

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BY

WESTINGHOUSE ELECTRIC CORPORATION

AEROSPACE DIVISION

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SPECIAL HANDLING

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APPENDIX - SUMMARY OF FLIGHTS

A F-101 FLIGHT TEST

## FLIGHT TESTS

Six radar missions to obtain data for altitude comparison and two aircraft flights to evaluate repairs to a fire warning system were flown in October. Specific information on the radar flights is tabulated in Appendix A.

Flight 190 was flown at an altitude of 40,000 feet using a recorder modified for the Field Flight Test conditions and with 12 db r-f attenuation inserted to simulate the signal-to-noise conditions of flights at 80,000 feet. Flight 191 was flown at 40,000 feet using the normal F-101 recorder and r-f configuration to provide a comparison. To verify the r-f attenuation, flight 192 was flown at 20,000 feet altitude with 12 db r-f attenuation, simulating the signal-to-noise of a normal F-101 40,000 foot flight. Other fly-bys were made on flight 192 with no r-f attenuation to show the best signal-to-noise at that altitude. On each of the flights, the target area was the Delaware River from Wilmington, Delaware, to Trenton, New Jersey. Repeatability of the course was good for the flights.

TABLE I  
F-101 PROGRAM SUMMARY  
October 1965

Flights Scheduled		11
Aircraft	2	
Radar	9	
Flights Accomplished		8
Aircraft	2	
Radar	6	
Good Data	3	
Poor Data	3	
Flights Cancelled		3
Aircraft	1	
Weather	2	
Inflight System Failures		
Waveguide Attenuator	-3-	2

Less than optimum operation was obtained on flight 187 because an intermittent battery connection caused unreliable frequency generator operation. A broken waveguide attenuator between the buffer amplifier and transmitter sporadically reduced the r-f drive to the transmitter on both flights 187 and 188, at times causing weak video. Radio communication problems restricted aircraft altitude to a maximum of 24,000 feet on flight 188.

A fire warning indication was observed on flight 187 similar to that reported in September on flight 186. Further tests indicated the temperature sensors for the warning system were defective. Since replacement of the sensors, the problem has not recurred.

A mandatory 50 hour inspection of the F-101 was started following flight 192. A five day delay in flying is expected.

#### MODIFICATIONS AND GROUND TESTS

##### Receiver

The breadboard receiver was installed in the aircraft following flight 186. A review of the history of video striping, such as reported in September, indicated severe striping has never occurred with the breadboard receiver. A comparison of breadboard and production receivers is underway to determine the cause of striping. In addition, stalo reflector voltage has been instrumented.

##### Power Supply

An overload occurred on the system 20 volt line during ground warm-up prior to flight 187. Several loads in the 20 volt distribution system were fused to isolate the source of the intermittent overload if it should recur.

##### KA-45A Camera

The camera was returned to the manufacturer again for correction of the shutter malfunction.

**B     SYSTEM****ANTENNA**

All of the array sticks for Antenna 002 have been bonded and given an 8 hour heat-pressure test at 550°F with a constant 30 psig internal air pressure. No failures occurred and no bubbles appeared as a result of these tests.

Three modules have been assembled and electrically tested. A comparison of these r-f patterns with earlier patterns indicated no change in electrical properties. Soldering and then electro-forming of the array sticks in the modules are the next procedures.

**MODIFICATIONS**

The July 1965 progress report listed 15 minor modifications, of which 9 were complete at that time. Status of the 6 incomplete modifications, plus those started since July, are reviewed as follows:

Modification	Units	
	Complete	In Work
Transmitter, TWT Filament Supply	3	0
Recorder, Flip-Flop Redesign	2	1
Recorder, Blanking Change	3	0
Recorder, Additional loop switch	3	0
Low Noise Pre-Amplifier (Par Amp)	1	2
Nav Tie-In, Integrator gain change		
System Units	3	0
Spare Units	2	0
Nav-Tie-In, Pitch gain adjustment	3	0
Transmitter, Vac-Ion operation in Stby	3	0
Transmitter, TWT filament Switching	2	1
Transmitter, TWT overload circuit	2	1
Recorder, ABC and light meter	1	2
Recorder, Aluminum rollers	1	2
Receiver, Addition of AGC	1	0
Transmitter Servo, Additional filtering	3	0

**RELIABILITY**

MTBF of the two systems for the last four months operation and since February 1964 is as follows:

	F-101 System	System 002
Report Period	6/23/65 to 11/5/65	8/17/65 to 10/31/65
Standby Time	189.5 hours	14.0 hours
Transmit Time	69.7 hours	5.0 hours
MTBF for Period	29.9 hours	4.7 hours
MTBF since February 1964	24.4 hours	9.1 hours

**C SPARES**

No items were added to the spares list in October. Status of spares is summarized:

	Items Shipped in October	Items Open	Per Cent Complete
System	2	17	99
Basic list plus first 10 amendments	2	6	99
Amendment 11	0	9	36
Ground Support Equipment			Complete

**D CORRELATOR OPERATION**

The triggering lamps for the data block transfer were relocated and the sensitivity readjusted to provide better reliability in the flash circuit. At present the far range is satisfactory. Work will continue on the problem of transferring the data flash on the near range.

E CORRELATOR MECHANICAL REVIEW

Both the technical memorandum and proposal on the White-Light Correlator Review are complete and will be released early in November.

Density of the output film varies across the range sweep because of variations in antenna pattern, spectral content of the carbon arc, spectral sensitivity of the film spectral transmission of the rainbow filter, and the cosine fourth power effect of the lenses in the optical system. Several correlations were made of flight 137 using normal output slits, wider than normal slits, and shaped slits to compensate for the uneven distribution. Results of these tests showed little improvement in the non-uniformity of density with shaped slits. Much of the non-uniformity is in the background rather than actual target density and may be due to stray light. The extraneous reflected images and degradation due to the wider slit was more objectionable than the original non-uniformity. No further work is planned with shaped slits. The Log-E-Tronic Dodging Printer can improve uniformity of 14 x 18 prints where required.

APPENDIX A - SUMMARY OF FLIGHTS			
FLIGHT NO.	187	188	189
DATE	10-6-65	10-15-65	10-18-65
ALTITUDE	40,000	20,000	40,000
AREA	Philadelphia, Pa.	Philadelphia, Pa.	Philadelphia, Pa.
PURPOSES	4 kc Recorder, High Altitude Data	4 kc Recorder, High Altitude Data	4 kc Recorder, High Altitude Data
SIGNIFICANT SYSTEM CHANGES	4 KC Recorder, Re-installed breadboard receiver.	Replaced VFO control batteries	None
RESULTS	Map best over center of range. In some areas resolution and contrast are good. Some small variations in density after clock 13 which may be attributed to loose tracking. VFO frequency wandered around before clock 13, with only occasional map data.	Because permission to fly at 40,000 ft. could not be obtained, flight was made at 20,000 ft. This resulted in an unusual map with 4kc range factor. Width of good focus in range was narrow but presentations in best areas were good. There were some density variation bands which could not be attributed to offset variation computed from instrumentation.	Map best from 1/3 range to center. Signal level is too low for good tree-grass contrast although bloom slightly. Resolution is not the best in either range or azimuth. Partly because of signal level, both near 1/2 range and far 1/2 range were faded. Some density variation bands during strong roll.



APPENDIX A - SUMMARY OF FLIGHTS			
FLIGHT NO.	190	191	192
DATE	10-25-65	10-28-65	10-29-65
ALTITUDE	40,000	40,000	20,000
AREA	Philadelphia, Pa.	Philadelphia, Pa.	Philadelphia, Pa.
PURPOSES	4 kc Recorder, High Altitude Data	8 kc Recorder, High Altitude Data	Low altitude data
SIGNIFICANT SYSTEM CHANGES	Repaired broken attenuator.	Recorder modified for 8 kc operation.	None
RESULTS	Best areas are good. Targets as small as 2 mils (14 ft) in range. Contrast is good. However there are areas where focus is bad over whole range and ranges where focus is best is not consistent throughout flight. Could be caused by some frequency instability.	Contrast and resolution are good over most of the map. Sensitivity was good since small targets were strong along roads. Offset was a little high and even bridges had little or no divergent clutter. Some low density bands were present due to tracking errors. Near side of near range swath was faded because of high offset due to antenna position.	Map is good over best focus range interval. Sensitivity is very good and better than strong 191, even when rf attenuation is 9 db or 12 db. Contrast, resolution and uniformity are better than usual. There is still low signal at near range.